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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/652,843 | 08/29/2003 | Wu Hung Ko | N1085-00241 | 2819 |
| 54657 | 7590 | 10/11/2005 | TSMC2003-082 | |
| DUANE MORRIS LLP IP DEPARTMENT (TSMC) 30 SOUTH 17TH STREET PHILADELPHIA, PA 19103-4196 | | | | |
| EXAMINER ROSASCO, STEPHEN D | | | | |
| ART UNIT | | PAPER NUMBER | | |
| 1756 | | | | |

DATE MAILED: 10/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/652,843

Applicant(s)

KO ET AL.

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Detailed Action

In response to the amendment of 8/8/05, the examiner withdraws the previous office action rejections and includes new rejections here.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-15 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The specific use of styrene as a purging gas to control the extent of a surface reaction by quenching the reactive gas in the system is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976).

Claim 1 recites a method for removing etching assist gas from a fabrication system used during defect repair of a photomask. Claim 6 recites a method for reducing surface defects. Claim 11 recites a method for reducing gas remaining on an MOS film of a photomask.

There is no description of the quenching reaction of the assist gas with styrene or what the nature of the interaction with the styrene gas is. The claims read that styrene is added to the system. The form of the addition, the fact that it is a gas, etc. is not represented by the claims.

Claims 3, 8 and 13 recite adding styrene to the etching assist gas. This is apparently during the etching process. It is unclear how why the styrene is used during etching when the purpose of adding the styrene is to inhibit some aspect of the etching reaction.

The only evidence that there is a beneficial effect with styrene is in comparison to the use of bromine as a purge gas.

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And that in the testing of the present invention, it was found that with a standard bromine purge, the CD variation was 22.4% after scanning 30 times, while with a standard styrene purge, the CD variation was 3.8% after scanning 50 times. Thus, styrene is significantly more effective in preventing damage to the MOS film.

The specification also does not describe when the styrene gas is introduced into the system. The measurement of the CD variation is also not described.

Claims 1, 6, 11, (and claims dependent therefrom) are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is unclear what the quenching reaction of the assist gas with styrene is or what the nature of the interaction with the styrene gas is.

Also section (b) of the claims reads "repairing said defect", when styrene is added to the system. However, the styrene does not actually repair the mask but is involved as a control in the process in that the claimed invention is directed to a method for fabrication of an integrated circuit, which includes a method for removing etching assist gas from a fabrication system used during defect repair of a photomask.

The applicant states that FIB deposition used to repair clear defects is more controllable than laser deposition, because the ion beam current profile also has a long tail which extends well beyond the nominal beam diameter, material is deposited in a relatively large area surrounding the intended deposit. This peripheral film is a fraction of the thickness of the intended deposit, but often must be removed to avoid degradation of transmission in surrounding clear regions. Removal of the peripheral film, or "halo" requires an extra step which adds to the complexity and time required for the repair process and introduces another

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possibility for damaging the quartz or otherwise introducing defects. In addition, because the quartz substrate charges during ion beam processing, the ion beam can be deflected and the repair patch will therefore not be located where expected.

It is unclear what the above description has to do with the styrene addition.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Chiu (6,361,904).

Chiu teaches a method for repairing an alternating phase shifting mask with a missing shifter layer, comprising the steps of: a. etching a trench in a quartz substrate of the alternating phase shifting mask in a defective shifter layer area using $\text{XeF}_{2.2}$ gas in a focused ion beam repair machine with a focused ion beam dosage between about $0.12 \text{ nC}/\mu\text{m}^2$ and $0.16 \text{ nC}/\mu\text{m}^2$ to provide a leading phase shift angle; and b. depositing an equivalent shifter layer, using a focused ion beam and styrene gas; wherein the transmittance of the equivalent shifter layer is about 6% and the phase shift angle is lagging such that the cumulative phase shift angle for the quartz etching and the equivalent shifter layer is about 180 degrees.

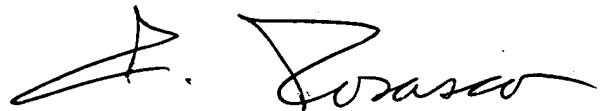
And wherein said shifter layer comprises styrene deposited using a focused ion beam dosage of between about $0.13 \text{ nC}/\mu\text{m}^2$ and $0.15 \text{ nC}/\mu\text{m}^2$.

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Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'S. Rosasco', with a stylized initial 'S'.

S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
10/03/05